

**CRYSTALLINE OR AMORPHOUS MEDIUM-K GATE OXIDES,  $Y_2O_3$  AND  $Gd_2O_3$**

**ABSTRACT**

A gate oxide and method of fabricating a gate oxide that produces a more reliable and thinner equivalent oxide thickness than conventional  $SiO_2$  gate oxides are provided. Also shown is a gate oxide with a conduction band offset of 2 eV or greater. Gate oxides formed from elements such as yttrium and gadolinium are thermodynamically stable such  
5 that the gate oxides formed will have minimal reactions with a silicon substrate or other structures during any later high temperature processing stages. The process shown is performed at lower temperatures than the prior art, which further inhibits reactions with the silicon substrate or other structures. Using a thermal evaporation technique to deposit the layer to be oxidized, the underlying substrate surface smoothness is preserved, thus  
10 providing improved and more consistent electrical properties in the resulting gate oxide.

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